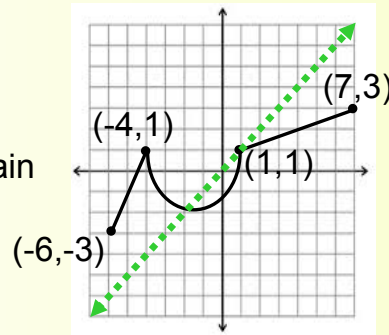


## Alg. 2 Warm Up #3- 4

1. Write an equation for  $f^{-1}(x)$ , state the domain and range for both  $f$  and  $f^{-1}$ .

$$f(x) = 4(x - 5)^2 + 7, \quad x \leq 5$$

2. Graph the inverse, state domain and range of both.



Monday or Tuesday space:

Solve. Clearly show an accurate process.

$$4|2x - 1| + 3 \leq 27$$

## HW Questions:

- 5-73. Let  $y = \log_2(x)$ . Rewrite the equation so that it begins with  $x =$ . Think about how you defined  $y = \log_2(x)$  if you get stuck. Put a large box around both equations. Do the two equations look the same? Do the two equations mean the same thing? Are they equivalent? How do you know? This is very important. Think about it, and write a clear explanation.

$y = \log_2 x$

$x = 2^y$

exponent

- 5-74. Every exponential equation has an equivalent logarithmic form and every logarithmic equation has an equivalent exponential form. For example:

$$\begin{array}{ccc}
 \text{exponent} & & \\
 \downarrow & & \\
 4^3 = 64 & \text{is equivalent to} & 3 = \log_4 64 \\
 \uparrow & & \uparrow \quad \uparrow \\
 \text{base} & & \text{exponent} \quad \text{base}
 \end{array}$$

Copy the table shown below and fill in the missing form in each row.

	Exponential Form	Logarithmic Form
a.	$y = 5^x$	
b.		$y = \log_7(x)$
c.	$8^x = y$	
d.	$A^K = C$	
e.		$K = \log_A(C)$
f.		$\log_{1/2}(K) = N$

75. Suppose you want to buy sugar. Packages of different sizes cost different amounts, but the relationship is not always proportional. That is, a bag twice as big does not usually cost twice as much. The chart shows the prices for various sizes of bags of sugar.

$\frac{\$1.92}{2} = \$0.96$ per pound	$\frac{0.95}{0.5} = \$1.90$ per pound
	$\frac{9.04}{10} = \$0.90$ per pound
	$0.88$
	$0.94$ per lb

$\frac{1}{2}$ lb bag	\$0.95
1 lb bag	\$1.38
2 lb bag	\$1.92
5 lb bag	\$4.70
10 lb bag	\$9.04
20 lb bag	\$17.52

- Find the rates in cost per pound. (Stores refer to this as unit pricing.)
- Does the unit price increase or decrease with the size of the bag?
- Does the unit rate change more drastically for smaller sizes or for larger sizes?

check difference between unit prices for small bags } compare that to differences between unit prices of large bags

- 5-76. Although the Quadratic Formula always works as a strategy to solve quadratic equations, for many problems it is not the most efficient method. Sometimes it is faster to factor or complete the square or even just "out-think" the problem. For each equation below, choose the method you think is most efficient to solve the equation and explain your reason. Then solve the problems that can be factored.

a.  $x^2 + 7x - 8 = 0$

b.  $(x+2)^2 = 49$

c.  $5x^2 - x - 7 = 0$

d.  $x^2 + 4x = -1$

$x^2 + 4x + \underline{\quad} = -1 + \underline{\quad}$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$a = 5$

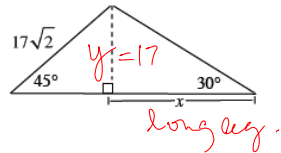
$b = -1$

$c = -7$

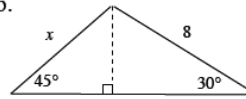
5-77. If  $10^{3x} = 10^{(x-8)}$ , solve for  $x$ . Show that your solution works by checking your answer.

5-78. Find the value of  $x$  in each diagram below.

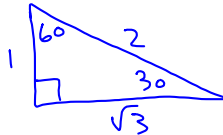
a.



b.



use special  $\Delta$ 's:



hypotenuse = 2(sh. leg)

long leg =  $\sqrt{3}$ (sh. leg)

$$x = \sqrt{3}(17)$$

$$x = 17\sqrt{3}$$

hypotenuse =  $\sqrt{2}$ (leg)

$$\frac{17\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}(y)}{\sqrt{2}}$$

5-79. Consider the function defined by inputs that are the length of the radii of a circle, and the outputs are the areas of those circles. Write the equation for this function and investigate it completely.

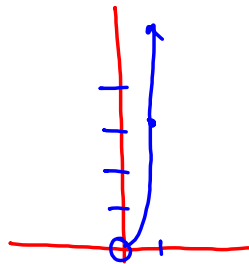
Multiple representations  
domain, range  
Special points?  
Symmetry?  
asymptotes?

dom:

$$x > 0$$

range:

$$y > 0$$



$x = \text{radius}$

$y = \text{area of circle}$

$$A = \pi r^2$$

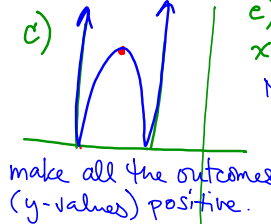
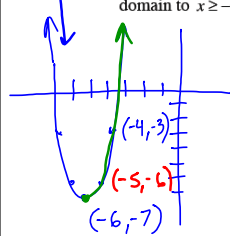
$$y = \pi x^2$$

$x$	$y$
0	0
1	$\pi$

\* only half the parabola because  $x = \text{radius}$  so  $x > 0$

5-80. Consider the equation  $y = (x+6)^2 - 7$ .

- Explain completely how to get a good sketch of the graph of  $y = (x+6)^2 - 7$ . *left 6, down 7, no stretch or compression*
- Explain how to change the graph from part (a) to represent the graph of  $y = (x+6)^2 + 2$ .
- Given your original graph, how can you get the graph of  $y = (x+6)^2 - 7$ ?
- Restrict the domain of the original parabola to  $x \geq -6$  and graph its inverse function.
- What would be the equation for the inverse function if you restricted the domain to  $x \geq -6$ ?

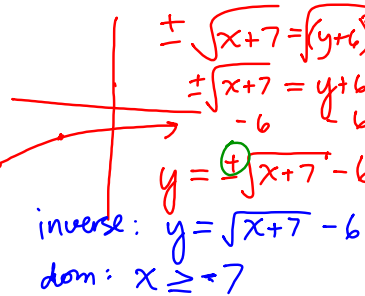


*c) Inverse:  
 $x = (y+6)^2 - 7$   
Now solve for y.*

$x$	$y$
-7	-6
-6	-5
-3	-4

*start*

*(-7, -6)*



*inverse:  $y = \sqrt{x+7} - 6$   
dom:  $x \geq -7$*

Blue CP's from yesterday:

$5-68$   
 $x$   $g(x)$   $\exp$   $2^{g(x)} = x$

0.25	
-1	
$\sqrt{2}$	$\frac{1}{2}$
0.2	$\approx$
$\frac{1}{8}$	-3

d) Find an outcome for the input  $x=25$ , to the nearest hundredth. Show your strategy.

$2^4$   $2^5$   $2^{4.64}$   $2^{4.65}$   
 $16 < 25 < 32$   $\approx 24.93$   $\approx 25.10$

for  $x=0.2$   $g(25) \approx 4.64$

$2^{-3}$   $2^{-2}$   
 $\frac{1}{8}$   $0.2$   $\frac{1}{4}$

exponent between  $-3$  and  $-2$  }  $2^{(-2.32)} \approx 0.2002$   
 $2^{(-2.31)} \approx 0.1999$

$g(0.2) \approx -2.32$

5-69  $g(x) = \log_5 x$

$x$	$g(x)$
$\frac{1}{25}$	-2
$\frac{1}{5}$	-1
1	0
5	1
25	2
125	3
625	4

a) Fill in the outcomes you know from base 5.

b) Estimate the outcomes for  $x=2$  and  $x=3$ .

for  $x=2$

$$x \rightarrow 1 < 2 < 5$$

$$5^0 < 5^{g(2)} < 5^1$$

\*  $g(2)$  is between 0 and 1

$$g(2) \approx$$

(Nearest hundredth)

$$2 \approx 0.43$$

$$3 \approx 0.68$$

$$5^? = 2$$

$$5^{0.43} \approx 1.998$$

$$5^{0.44} \approx 2.03$$

$$g(2) \approx 0.43$$

for  $x=3$

$$x \rightarrow 1 < 3 < 5$$

$$5^0 < 5^? < 5^1$$

$g(3)$  is between 0 and 1

$$g(3) \approx$$

(Nearest hundredth)

$$5^? = 3$$

$$5^{0.68} \approx 2.987$$

$$5^{0.69} \approx 3.03$$

$$g(3) \approx 0.68$$

5-69 cont'

b) Think about relationships between 2, 4, and 8.

How can you express 4 and 8 using exponent rules with base 2?

$$2^2 = 4$$

$$2^3 = 8$$

From your estimation,  $2 \approx 5^{0.43}$

How can we use that to get  $g(4)$  &  $g(8)$ ?

$$g(4)$$

$$(2^2)^2 = 4$$

$$(5^{0.43})^2 \approx 4$$

$$5^{0.86} \approx 4$$

$$g(4) \approx 0.86$$

$$g(8)$$

$$2^3 = 8$$

$$(5^{0.43})^3 \approx 8$$

$$5^{1.29} \approx 8$$

$$g(8) \approx 1.29$$

Using exponent rules to fill in the rest of the table: (nearest hundredth)

$(a^m)^n = a^{mn}$        $a^m \cdot a^n = a^{m+n}$

$x$	$g(x)$
4	$\approx 0.86$
8	$\approx 1.29$
6	$\approx 1.11$
10	$\approx 1.43$
100	$\approx 2.86$
$\frac{1}{2}$	$\approx -0.43$

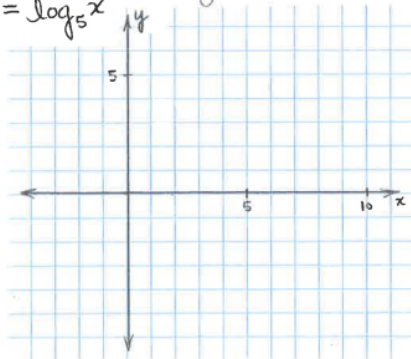
• for  $x=6 \rightarrow$  think about the relationship with  $2+3$   
show your thinking here:  
 $2 \cdot 3 = 6$   
 $(5^{0.43})(5^{0.68}) \approx 6$        $5^{(0.43+0.68)} = 5^{1.11} \approx 6$

• estimate  $g(10)$ ,  $g(100)$  and  $g(\frac{1}{2})$  showing your thinking:  
 $5 \cdot 2 = 10$        $5^{1.43} \approx 10$        $10^2 = 100$   
 $(5^{1.43})^2 \approx 100$   
 $5^{2.86} \approx 100$   
 $g(10) \approx 1.43$        $g(100) \approx 2.86$

$5^? = \frac{1}{2}$   
 $2^{-1} = \frac{1}{2}$   
 $(5^{0.43})^{-1} \approx \frac{1}{2}$   
 $5^{-0.43} \approx \frac{1}{2}$

$g(6) \approx 1.11$   
 $g(\frac{1}{2}) \approx -0.43$

Use the values from your tables to carefully sketch the graph of  $g(x) = \log_5 x$



Draw the vertical asymptote with a dashed line.

What relationship does your graph of  $g(x) = \log_5 x$  have with the graph of  $y = 5^x$ ?

- 5-71. While the idea behind the Ancient Puzzle is more than 2100 years old, the symbol **log** is more recent. It was created by John Napier, a Scottish mathematician in the 1600's. "log" is short for **logarithm**, and represents the function that is the **inverse of an exponential function**. You can use this idea to find the inverse equations of each of the following functions. Find the inverses and write your answers in  $y =$  form.

a.  $y = \log_9(x)$     b.  $y = 10^x$     c.  $y = \log_6(x+1)$     d.  $y = 5^{2x}$

Switch  $x$  &  $y$  for inverse:

$$x = \log_6(y+1)$$

Now write in exponent form:

$$6^x = y+1$$

Solve for  $y$ :

$$y = 6^x - 1$$

# HW: 5 -

## # 84 ---> 92

Friday's Short Quiz:

- \* Write an inverse equation.
- \* Graph an inverse, state domain & range.
- \* Solve a multi step absolute value inequality.